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AUTHOR Evans, Kenneth L.
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ABSTRACT

There has been mixed research evidence for an hypothesized greater reinforcement value associated with democratically supervised work, although supervisory style, both autocratic and democratic, and its effects on group productivity have been the subjects of extensive investigations in industrial and social psychology. The effects of supervisory style and social need level upon group productivity were examined with 54 undergraduates who were placed into 18 groups of 3 students each on the basis of either low, moderate, or high FIRO-B social need scores. Three groups in each social need condition received either autocratic or democratic supervision during three 50-minute sessions of a group puzzle-solving task. Verbal interactions were recorded using the Bales Interaction Process Analysis system. Autocratically supervised groups were consistently more productive than democratic groups across all social need levels. Low social need groups were more productive than moderate or high groups. The quantity of group verbal interactions appeared directly related to social need level. Verbal interactions for all groups were negatively correlated with productivity for most IPA categories, suggesting that autocratically supervised groups and low social need groups were more productive because they engaged in less conversation. (Author)

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EFFECTS OF SUPERVISORY STYLE AND SOCIAL NEED LEVEL UPON GROUP PRODUCTIVITY

Kenneth L. Evans
Auburn University

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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INTRODUCTION

Supervisory style, both democratic and autocratic, and its effects upon group productivity have been the subjects of extensive investigation in industrial and social psychology. The initial impetus to this body of research appears to have been provided by Lewin and his associates (Lewin & Lippitt, 1938; Lewin, Lippitt, & White, 1939; Lippitt & White, 1958). Their research advocated the superiority of democratic supervision, yet no objective measure of productivity was utilized. Additional support for the greater effectiveness of the democratic style has come from Argyle, Gardner, and Cioffi (1958), Day and Hamblin (1964), and Levine (1973). The common assumption has traditionally been that workers will produce more under democratic supervision than autocratic supervision as a result of an hypothesized greater reinforcement value associated with work under the democratic condition; further, productivity under democratic supervision was viewed as providing a pathway for need fulfillment (Sales, 1966).

However, reviews of the literature have failed to demonstrate the superiority of any particular supervisory style (Hare, 1966; Sales, 1966; Stogdill, 1974). Shaw (1955) found that autocratic supervision was associated with greater productivity. No differences between the two supervisory styles were reported by McCurdy and Eber (1953) and by Morse and Reimer (1956). Since the middle 1960s investigations of the democratic-autocratic dimension of supervisory style have waned, perhaps due to the conclusion that no style of supervision is clearly better than the others. More recently a multiple factor approach to investigating the determinants of productivity has been predominant, and it appears that the general area of democratic versus autocratic supervision has become submerged in research related to multidimensional and more comprehensive theories of leadership such as the contingency

model of Fiedler (1967). Fiedler's model predicts that leadership effectiveness is a joint function of leadership style and situation favorability.

There are at least three major methodological weaknesses that pertain to prior research as a whole. First, operational definitions of supervisory style have been inconsistent across investigations (Sales, 1966). For example, it is difficult to precisely compare autocratic supervision with "giving orders" (Shaw, 1955), "hierarchical control" (Morse & Reimer, 1956), "close" supervision (Day & Hamblin, 1964), and "low control" (Levine, 1973). It appears that what is needed is a relatively uncomplicated operational definition of democratic and autocratic supervision which synthesizes the major qualities of previously cited definitions.

A second weakness is that prior research has generally failed to investigate the process by which groups of individuals become productive (Steiner, 1972). As McGrath and Altman (1966) have suggested, perhaps researchers should focus upon the interactive behavior of groups as intervening variables which mediate the effects of group "inputs", such as leader behavior or subordinate personality, upon the "output" variables such as group productivity or satisfaction. One approach would be to investigate the verbal interactions of groups using the Bales (1950) Interaction Process Analysis system such that the resulting data could then be related to subsequent productivity.

Third, Steiner (1972) argues that researchers have neglected to attend to the demands which tasks impose upon groups. It would seem that these task demands could be minimized to the extent that a task was utilized which, while challenging, could be expected to fall within the behavioral repertoire of the vast majority of individuals. Through random assignment of groups to treatment conditions and through the use of several groups per treatment condition, the effects of individual differences in task ability could be reasonably controlled.

Stogdill (1974) has suggested that leadership style may interact with task and subordinate characteristics in its relationship to group performance. Support for this position has come from Weed, Mitchell, and Moffitt (1976). In an investigation that attempted to control for some of the methodological weaknesses of prior research, they compared leadership style, task type, and subordinate personality as predictors of performance with male undergraduates. Measures of performance yielded a significant ($p < .05$) leadership style X subordinate personality X task interaction. However, two important aspects of this experiment seem methodologically unsatisfactory. First, performance was assessed following an unusually brief experimental period. And more importantly, it appears that the effects of leadership style are confounded with the effects of the leaders themselves, as there is only one leader in each of the leadership style conditions. Thus, it is not apparent whether leadership style or other unmeasured personal characteristics of the leaders themselves are more important in obtaining the reported findings, though the amounts of interaction with subordinates were equated for all leaders.

As stated previously, there has been mixed research evidence for an hypothesized greater reinforcement value associated with democratically supervised work. If one were to define positive reinforcement as the presentation of a stimulus contingent upon a response (see Reynolds, 1968, p. 9), one might view style of supervision as a complex reinforcing stimulus presented on a variable interval schedule of reinforcement which affects the future rate or quality of work behavior (response or response chain). Perhaps research should attempt to identify those individuals for which democratic supervision is a reinforcing stimulus and those for which autocratic supervision is reinforcing. To expect differences in the value of reinforcement across individuals is not without precedent. Lippitt and White (1958)

described one boy, whose father had a military background, who seemed to prefer authoritarian supervision. Similarly, Hare (1976) indicated the importance of individual expectations in his review of leaders in autocracies.

One subordinate personality characteristic that might differentially effect the reinforcement value of democratic and autocratic supervision across individuals is the construct of social or interpersonal need. Schutz (1958) developed a three-dimensional theory of interpersonal behavior based upon individual differences in the need for inclusion, control, and affection. If one were to operationally define supervisory style in terms of a communication network, it could be hypothesized that individuals with relatively high levels of social or interpersonal need would find the two-way communication afforded by democratic supervision more reinforcing to work behavior. In contrast, individuals with relatively low levels of social need may experience the one-way communication of autocratic supervision to be more reinforcing to their work behavior. In this sense social need level would function as an hypothesized moderator variable in predicting the effects of supervisory style upon productivity.

In summary, the purpose of the present study is twofold. First, the relationship between group productivity and supervisory style, operationally defined in terms of communication networks, is investigated using a research design that attempts to control for the methodological deficiencies of past research. Second, the validity of an hypothesis that social need is a subordinate personality characteristic that moderates the relationship between supervisory style and group productivity is examined.

METHOD

Subjects

Subjects for the present study consisted of 54 male undergraduate students at Auburn University, 18 groups of three subjects each, who were selected for participation in the experiment on the basis of their responses to the FIRO-B (Schutz, 1967), which was originally administered to 111 male undergraduates. These subjects were solicited from undergraduate psychology classes by the experimenter, and those students who elected to participate in this research project were given extra class credit. In addition to the 54 experimental subjects, three students participated in two of the three experimental sessions; however, their participation was prematurely terminated due to equipment malfunction.

Materials and Design

The present study manipulated the independent variables of supervisory style and social need level. Two levels of supervisory style were investigated: democratic supervision and autocratic supervision. Three levels of social need were utilized: low, moderate, and high. Three dependent measures were employed: group productivity, quantity and quality of verbal interactions in the groups, and semantic differential responses obtained from the group workers following each session.

Independent Variables

Supervisory style. Democratic and autocratic supervision were operationally defined according to the procedural instructions presented prior to the experimental sessions. Group members rotated the supervisory role such that each group member served as the supervisor during one experimental session. Nine groups received democratic supervision while nine additional groups received autocratic supervision. Democratic groups were informed that two-way

communication was permitted between the supervisor and group workers, though it was the ultimate decision of the supervisor as to the manner in which the group would actually proceed. In contrast, autocratic groups were instructed that only one-way communication from the supervisor to the group workers would be permitted. In this supervisory condition verbal interactions were limited to those directed from the autocratic supervisor to the group workers. In the event that any autocratic group member verbally interacted, the group was reminded of the procedural instructions upon the first occurrence of a violation in each session. Future violations of the autocratic instructions were recorded.

Social need level. The social need levels of subjects were measured by the FIRO-B (Schutz, 1967). Scores on the expressed inclusion, wanted inclusion, expressed affection, and wanted affection subscales were summed to yield a FIRO-B Σ score. This Σ score, with a possible range of 0 to 36, excluded scores on the expressed control and wanted control subscales of the FIRO-B. There are two reasons for this omission. First, a clinical interpretation of wanted control subscales is different for males and females (Ryan, 1967). Secondly, both control subscales are not as highly intercorrelated with the other subscales, indicating that these are less related to the construct of social need (Schutz, 1967). Six low social need groups were composed of subjects whose FIRO-B Σ scores were less than or equal to 10. Six moderate social need groups were composed of subjects whose FIRO-B Σ scores were between 16 and 24, inclusive. Similarly, six high social need groups were composed of subjects whose FIRO-B Σ scores were equal to or greater than 30. Individuals whose FIRO-B Σ scores were between 11 and 15 and between 25 and 29 were not selected to participate in the experiment in order that three discrete social need levels could be formed. This selection procedure also

served to minimize the possibility that subjects were incorrectly classified in a particular social need level. Within each social need level, three groups received democratic supervision and three groups received autocratic supervision. In summary, the present investigation created six independent experimental conditions with three groups in each condition: democratic supervision/low social need, autocratic supervision/low social need, democratic supervision/moderate social need, autocratic supervision/moderate social need, democratic supervision/ high social need, and autocratic supervision/high social need.

Dependent Variables

Group productivity. Three 500-piece Jaymar jigsaw puzzles were used to measure group productivity during each 50-minute experimental session. All puzzles measured 46 cm by 33 cm, with all puzzle pieces having been cut identically. The only difference between puzzles was that each illustrated a different cover of the Saturday Evening Post. Sixteen students who participated in a pilot study (Evans, 1976) were asked to order the three puzzles in terms of total level of difficulty and to give their reasons for doing so. Complete agreement was reached in the order of difficulty across puzzles, and it appeared that increasing difficulty was related to greater numbers of human figures illustrated in the puzzles. Using these findings, a subjective system of evaluating the difficulty level of each puzzle piece was developed. This system attempted to control for difficulty across puzzles in order that the relative contributions of individual group members to the total group effort could be determined. In addition, it attempted to control for the possibility that different groups might approach the puzzle differently such that puzzle difficulty might confound the results. Finally, this system would more effectively enable learning effects within and across sessions to be measured.

Using this subjective system, individual puzzle pieces were given difficulty scores of either one, two, or three points. The difficulty scores were written in ink on the underside of each puzzle piece. Three-point puzzle pieces were judged by the experimenter to have been the most difficult. Difficulty scores were assigned using the following criteria:

1 point: puzzle pieces which have one straight edge and which comprise the perimeter of the completed puzzle.

2 points: puzzle pieces which can be grouped with five or more other pieces on the basis of general color, shade, or pattern of visual design.

3 points: puzzle pieces which cannot be grouped with five or more other pieces on the basis of general color, shade, or pattern of visual design.

Using these criteria, the sum total of the difficulty points for the 500 pieces of the puzzle judged to have been the most difficult in the pilot study was 1,114 points. Likewise, the sum total of the difficulty points of the puzzle judged to have been the second most difficult was 1,063 points, while that of the puzzle judged to have been the least difficult was 1,006 points. Three female undergraduates then were each asked to put together one of the three puzzles individually. Using the scoring criteria outlined above, they were asked to sort the 500 pieces of a puzzle into 1-point, 2-point, and 3-point categories in order that inter-rater reliability of the scoring system for each puzzle could be assessed. Utilizing a method discussed by Kelly (1977), reliability coefficients were found to be .94, .92, and .91 for the least difficult, second most difficult, and most difficult puzzle respectively. The three puzzles were presented in ascending order of difficulty during the three experimental sessions such that increases in group productivity across sessions could then be attributed to learning or practice effects. In the experimental sessions subjects were seated around the three shortest sides of a trapezoidal table. Each group member was given a tally counter so that a

cumulative record of group and individual productivity could be obtained. Group supervisors were instructed to participate in the puzzle task along with the group workers. Group members were instructed to tally the difficulty points of individual puzzle pieces on their counters as they interconnected them during the course of the session, with the constraint that each puzzle piece could be counted only once. Productivity, as measured in terms of difficulty points, was recorded at five 10-minute intervals during each 50-minute session. Groups were informed of the time remaining in each session at the time of each productivity recording. In addition, an illustration of the completed puzzle was provided to each group at the beginning of sessions to be used as a guide.

Verbal interactions. Experimental sessions were videotaped in order that the verbal interactions of the groups could later be coded according to the Bales (1950) Interaction Process Analysis (IPA) system. A tabulation sheet for IPA data adapted from Bales' IPA data sheet (Patton & Giffin, 1973) was used to record verbal interactions. Although the IPA system was designed to include both verbal and nonverbal communication, it appears that this classification system has been less effective with nonverbal interactions (McGrath & Altman, 1966; Steiner, 1972). For this reason the present analysis was limited to verbal interactions. Interactions were coded for the group as a whole because verbal interactions of group members could not be treated as independent data. Additionally, interactions were recorded and blocked into five 10-minute intrasession intervals on the tabulation sheet. A graduate student in clinical psychology was trained in the use of the IPA system, such that the inter-rater reliability of the interaction data could be assessed. Intra-rater and inter-rater reliability measures were obtained using 10-minute or 20-minute videotaped segments of each experimental session,

counterbalanced for each experimental condition across intrasession intervals. Reliability samples constituted 2/9 of the total experimental time.

Semantic differential. A seven-point semantic differential scale consisting of ten pairs of bipolar adjectives was constructed in order to determine the views which group members held towards their supervisors. The particular bipolar adjectives selected for inclusion in the semantic differential were intended to provide a representative sample of the attitudinal dimensions of evaluation, potency, and activity (Osgood, Suci, & Tannenbaum, 1957). At the conclusion of each experimental session the supervisor was dismissed, and the two group workers were then instructed to describe the supervisor for that session using the semantic differential scale. This scale served a twofold purpose. First, it was designed to determine whether group workers viewed the supervisory styles of their supervisors as intended by the experimental conditions. For example, did group workers in the autocratic condition actually view their supervisors as being autocratic? Second, the semantic differential was intended to provided an estimate of the relative satisfaction derived by various subjects under different supervisory conditions.

Procedure

In summary, subjects were selected on the basis of their FIRO-B Σ scores and were assigned to either low, moderate, or high social need groups. Groups were then randomly assigned to either the democratic or autocratic supervisory condition. Group members met for the initial session, at which time instructions were orally presented by the experimenter. These instructions, which were identical for each session, described the particular supervisory style in effect and informed the group members of the procedure for counting and tallying the difficulty points of puzzle pieces. One group member was randomly selected to be the group supervisor such that each group member was the

supervisor during one experimental session. During each session the supervisor was seated between the two group workers. Groups were instructed that their goal was to complete as many puzzle pieces as possible in fifty minutes, but were not informed that the numbers on the backs of puzzle pieces represented difficulty points. Each group was informed of the time remaining at the 10, 20, 30, 40, and 49-minute marks of each 50-minute session. At the conclusion of each session group members were instructed not to discuss the experimental procedures with one another between sessions. At this time the supervisor was dismissed and the group workers completed the semantic differential scale. The three experimental sessions were completed within a one week period for 16 of the 18 groups. The remaining two groups completed the sessions within 10 days. All groups were informed of the rationale and hypotheses of the experiment after the final session.

RESULTS

The present experiment employed three dependent variables: group productivity operationalized in terms of difficulty points, verbal IPA data for the group as a whole, and descriptions of supervisors based upon responses of group members to a semantic differential scale. The results of the analysis of each variable will be presented separately.[1]

Analysis of Group Productivity Data

A mixed factorial analysis of variance (ANOVA) design, with Supervisory Style (two levels: democratic, autocratic) and Social Need Level (three levels: low, moderate, high) as the between subjects factors and Session (three levels)

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[1]Standard statistical programs from SAS 76 (Barr, Goodnight, Sall, & Helwig, 1976) were employed in performing these analyses.

and Intrasession Interval (five levels) as the within subjects factors, was performed. Group productivity was the dependent variable for this analysis. A summary of the results of this analysis is presented in Table 1. Significant main effects were found for Supervisory Style, Social Need Level, Session, and Intrasession Interval. The Session X Intrasession Interval interaction was also statistically significant. Note that the Supervisory Style X Social Need Level interaction was not statistically significant.

Figures 1 through 3 illustrate the differences in mean productivity obtained under two contrasting supervisory styles for subjects in three Social Need Level conditions[1]. Subjects working under autocratic supervision were more productive than those working under democratic supervision. In terms of Social Need Level, subjects low in social need were most productive while those moderate in social need fell between these two extremes. Group productivity increased from session to session. Within each session, it generally appeared that group productivity was lowest initially, peaked during the second interval, then declined thereafter. However, the significant Session X Intrasession Interval interaction suggested there may have been deviations in this general trend across sessions. Omega-square statistics were .0160 for Supervisory Style, .0125 for Social Need Level, .0205 for Session, and .1039 for Intrasession Interval. While each main effect was statistically significant, it appeared that only Intrasession Interval was of practical significance in accounting for a major proportion of the variance in group productivity.

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[1]The set of three figures graphs the Supervisory Style X Social Need Level X Session X Intrasession Interval interaction.

TABLE 1

ANALYSIS OF VARIANCE OF GROUP PRODUCTIVITY

	Source	SS	df	MS	F
1	Supervisory Style (SS)	2882.45	1	2882.45	1/5[a]=13.80**
2	Social Need (SN)	2509.69	2	1254.85	2/5 = 6.01*
3	Session (S)	3566.79	2	1783.39	3/10=27.21****
4	Intra Session Interval (I)	18144.76	4	4536.19	4/16=24.60****
5	Within Groups	2505.96	12	208.83	5/6 = 0.25
6	Within Subjects	29623.38	36	822.87	
7	SS X SN	674.76	2	337.38	7/5 = 1.62
8	SS X S	35.68	2	17.84	8/10= 0.27
9	SN X S	69.69	4	17.42	9/10= 0.27
10	S within Groups	1572.84	24	65.54	10/11= 0.23
11	S within Subjects	20456.89	72	284.12	
12	SS X SN X S	335.32	4	83.83	12/10= 1.28
13	SS X I	334.60	4	83.65	13/16= 0.45
14	SN X I	882.35	8	110.29	14/16= 0.56
15	S X I	2929.77	8	366.22	15/19= 2.45*
16	I within Groups	8850.34	48	184.38	16/17= 1.43
17	I within Subjects	18619.73	144	129.30	
18	SS X SN X S X I	1175.25	16	73.45	18/19= 0.49
19	S X I within Groups	14368.41	96	149.67	19/20= 1.26
20	S X I within Subjects	34288.67	288	119.06	
21	SS X SN X I	570.49	8	71.31	21/16= 0.39
22	SS X S X I	861.35	8	107.67	22/19= 0.72
23	SN X S X I	2210.68	16	138.17	23/19= 0.92

*p < .05
**p < .01
****p < .0001

[a]These ratios represent the sources used as numerator (effect) and denominator (error term) for each F - test.

FIGURE 1. MEAN PRODUCTIVITY OF LOW SOCIAL NEED SUBJECTS BY SESSION AND INTRASESSION INTERVAL FOR EACH SUPERVISORY STYLE

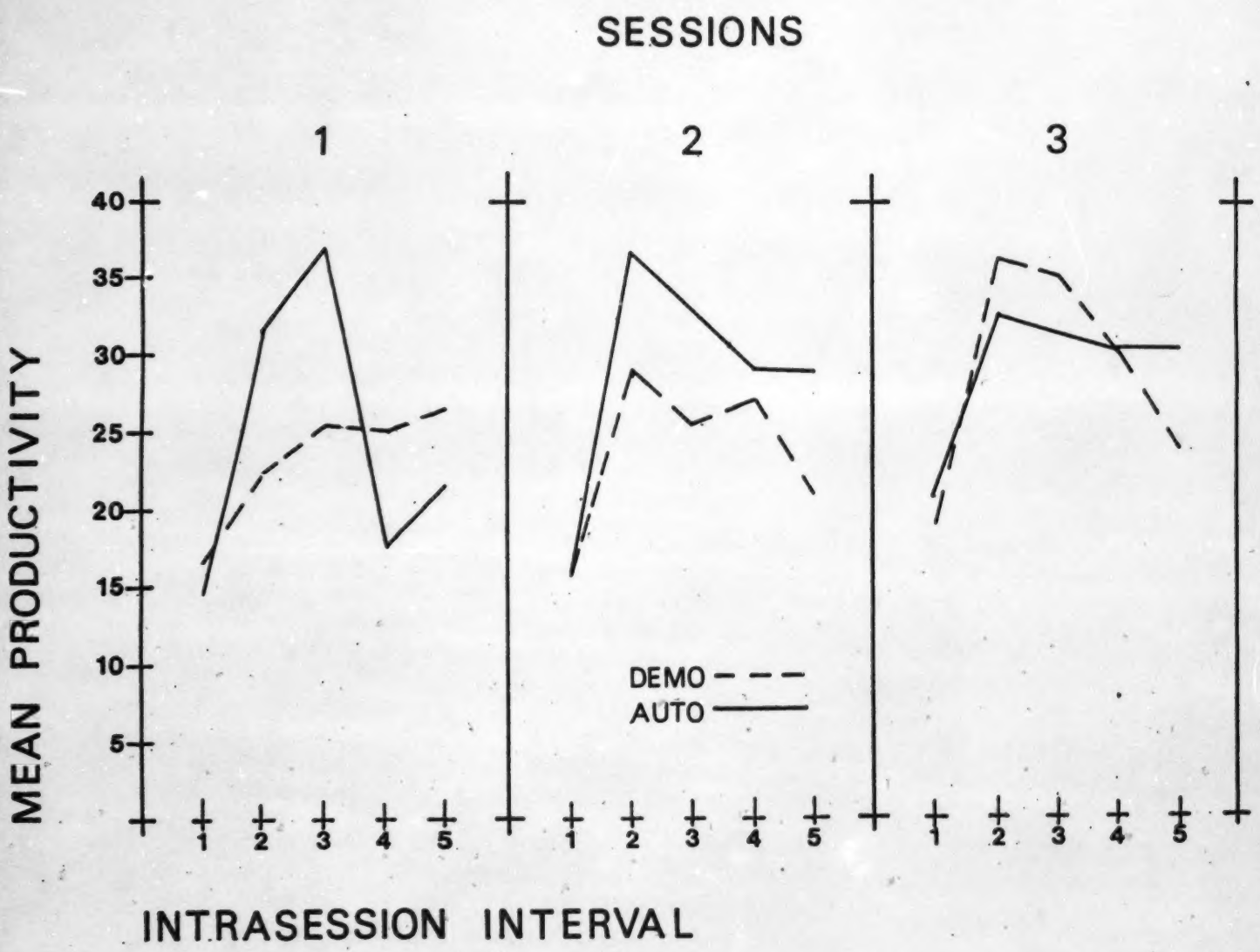


FIGURE 2. MEAN PRODUCTIVITY OF MODERATE SOCIAL NEED SUBJECTS BY SESSION AND INTRASESSION INTERVAL FOR EACH SUPERVISORY STYLE

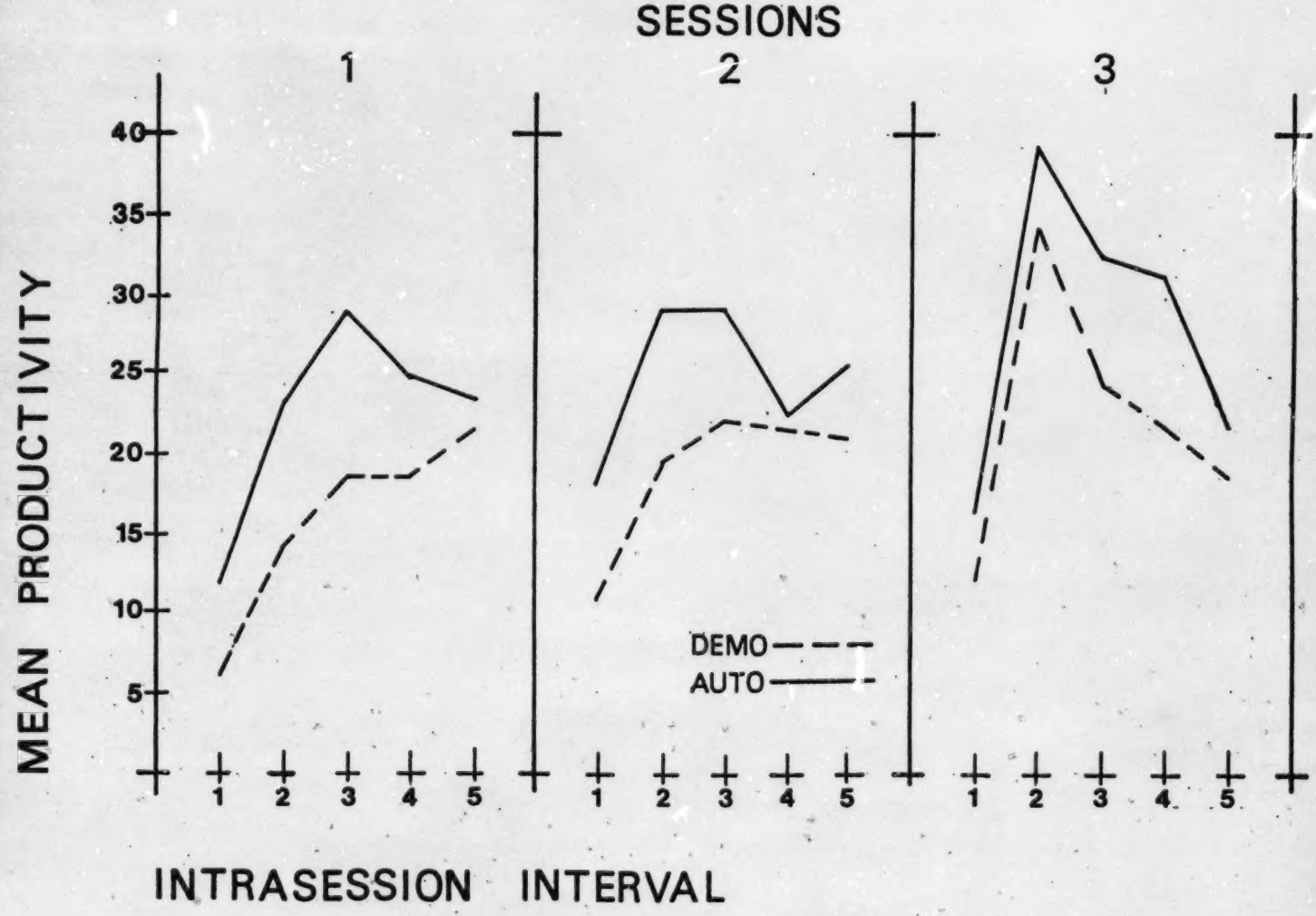
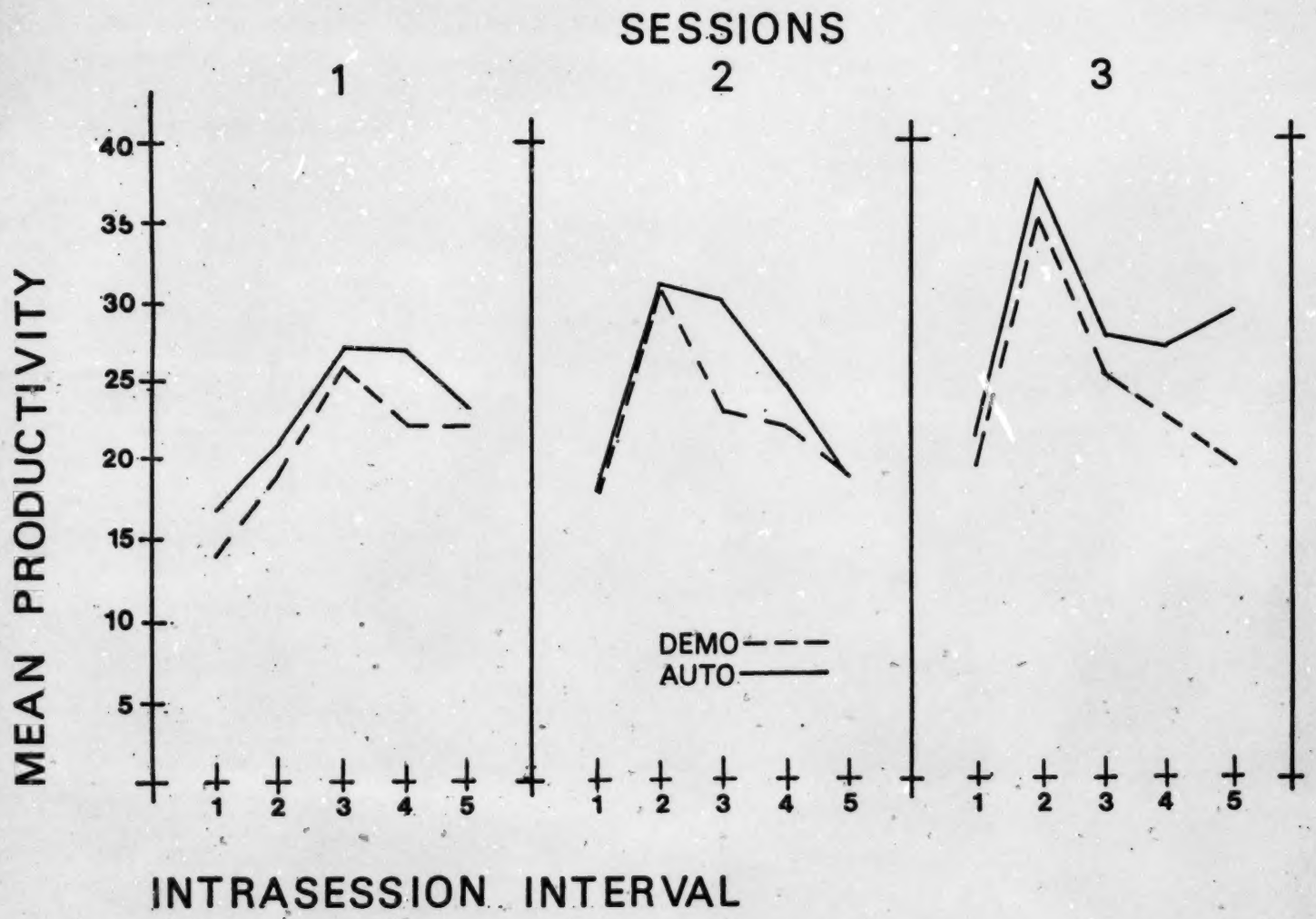


FIGURE 3. MEAN PRODUCTIVITY OF HIGH SOCIAL NEED SUBJECTS BY SESSION AND INTRASESSION INTERVAL FOR EACH SUPERVISORY STYLE



Analysis of Verbal Interaction (IPA) Data

Verbal interactions within each Intrasession Interval were summed across all groups to determine the total inter-rater and intra-rater reliabilities for the IPA data. All reliability measures were determined utilizing a method discussed by Kelly (1977) whereby the number of agreements are divided by the sum of the number of agreements plus the number of disagreements. The total inter-rater reliability was found to be .85, with a range from .50 for "Asks for suggestions" to .91 for "Gives information". Similarly, the total intra-rater reliability was found to be .89, with reliabilities ranging from .70 for "Asks for suggestions" to 1.00 for "Disagrees". Because reliabilities were based upon the cumulative number of interactions which occurred at the conclusion of a 10-minute Intrasession Interval, the agreement between raters or ratings concerning single verbal interactions was not determined. While these reliabilities may have been an overestimate of the actual consistency of agreement, they would appear to be satisfactory as a prerequisite to further data analysis.

A mixed factorial analysis of variance (ANOVA) design, with Supervisory Style (two levels: democratic, autocratic) and Social Need Level (three levels: low, moderate, high) as the between subjects factors and Session (three levels) and Intrasession Interval (five levels) as the within subjects factors, was performed for the total number of verbal interactions summed across all IPA categories. Similarly, identical ANOVA designs were performed for each IPA category separately, and for positive socioemotional reactions, task answers, task questions, and negative socioemotional reactions. The number of group verbal interactions served as the dependent variable in each of these analyses. Summaries of the results for the analyses of the total number of verbal interactions, positive socioemotional reactions, task answers, task questions, and negative socioemotional reactions are presented in Tables 2 through 6.

TABLE 2

ANALYSIS OF VARIANCE OF IPA DATA:

TOTAL[a]

Source	SS	df	MS	F
Between	115231.66	89	1294.74	
Supervisory Style (SS)	54528.03	1	54528.03	225.68****
Social Need (SN)	15495.92	2	7747.96	32.07****
SS X SN	8473.49	2	4236.74	17.53****
Session (S)	7591.79	2	3795.89	15.71****
SS X S	5171.49	2	2585.74	10.70****
SN X S	496.53	4	124.13	0.51
SS X SN X S	1314.56	4	328.64	1.36
Intra Session Interval (I)	10556.64	4	2639.16	10.92****
SS X I	5307.80	4	1326.95	5.49***
SN X I	1184.16	8	148.02	0.61
SS X SN X I	618.07	8	77.26	0.32
S X I	695.51	8	86.94	0.36
SS X S X I	741.96	8	92.74	0.38
SN X S X I	2041.29	16	127.58	0.53
SS X SN X S X I	1014.44	16	63.40	0.26
Within	43491.33	180	241.62	
Total	158723.00	269		

***$p < .001$
****$p < .0001$

[a]This represents the total number of verbal interactions summed across each of the 12 IPA categories.

TABLE 3

ANALYSIS OF VARIANCE OF IPA DATA:

POSITIVE SOCIOEMOTIONAL REACTIONS[a]

Source	SS	df	MS	F
Between	3794.52	89	42.64	
Supervisory Style (SS)	1722.68	1	1722.68	123.54****
Social Need (SN)	233.52	2	116.76	8.37***
SS X SN	324.81	2	162.40	11.65****
Session (S)	185.47	2	92.74	6.65**
SS X S	112.81	2	56.40	4.04*
SN X S	60.59	4	15.15	1.09
SS X SN X S	74.64	4	18.66	1.34
Intra Session Interval (I)	374.26	4	86.81	6.71****
SS X I	345.36	4	86.34	6.19****
SN X I	103.41	8	12.93	0.93
SS X SN X I	75.60	8	9.45	0.68
S X I	24.90	8	3.11	0.22
SS X S X I	21.04	8	2.63	0.19
SN X S X I	88.70	16	5.54	0.40
SS X SN X S X I	46.73	16	2.92	0.21
Within	2510.00	180	13.94	
Total	6304.52	269		

*p < .05
**p < .01
***p < .001
****p < .0001

[a]This represents the summed total of all verbal interactions in the first, second, and third categories of the Bales (1950) Interaction Process Analysis system.

TABLE 4

ANALYSIS OF VARIANCE OF IPA DATA:

TASK ANSWERS[a]

Source	SS	df	MS	F
Between	43898.39	89	493.24	
Supervisory Style (SS)	20418.90	1	20418.90	214.35****
Social Need (SN)	6074.45	2	3037.23	31.88****
SS X SN	3001.30	2	1500.65	15.75****
Session (S)	3045.79	2	1522.89	15.99****
SS X S	1865.16	2	932.58	9.79****
SN X S	175.61	4	43.90	0.46
SS X SN X S	417.84	4	104.46	1.10
Intra Session Interval (I)	4662.90	4	1165.73	12.24****
SS X I	1371.10	4	342.77	3.60**
SN X I	595.03	8	74.38	0.78
SS X SN X I	210.93	8	26.37	0.28
S X I	284.70	8	35.59	0.37
SS X S X I	365.84	8	45.73	0.48
SN X S X I	871.57	16	54.47	0.57
SS X SN X S X I	537.27	16	33.58	0.35
Within	17146.67	180	95.26	
Total	61045.05	269		

**$p < .01$

****$p < .0001$

[a]This represents the summed total of all verbal interactions in the fourth, fifth, and sixth categories of the Bales (1950) Interaction Process Analysis system.

TABLE 5

ANALYSIS OF VARIANCE OF IPA DATA:

TASK QUESTIONS[a]

Source	SS	df	MS	F
Between	4868.46	89	54.70	
Supervisory Style (SS)	1820.00	1	1820.00	116.23****
Social Need (SN)	845.56	2	422.78	27.00****
SS X SN	318.50	2	154.25	10.17****
Session (S)	244.27	2	122.14	7.80***
SS X S	223.65	2	111.83	7.14***
SN X S	63.59	4	15.90	1.02
SS X SN X S	96.88	4	24.22	1.55
Intra Session Interval (I)	330.26	4	82.56	5.27***
SS X I	401.68	4	100.42	6.41****
SN X I	77.81	8	9.73	0.62
SS X SN X I	124.87	8	15.61	1.00
S X I	81.32	8	10.16	0.65
SS X S X I	36.61	8	4.58	0.29
SN X S X I	140.15	16	8.76	0.56
SS X SN X S X I	63.30	16	3.96	0.25
Within	2818.67	180	15.66	
Total	7687.13	269		

***$p < .001$
****$p < .0001$

[a]This represents the summed total of all verbal interactions in the seventh, eighth and ninth categories of the Bales (1950) Interaction Process Analysis system.

TABLE 6

ANALYSIS OF VARIANCE OF IPA DATA:

NEGATIVE SOCIOEMOTIONAL REACTIONS[a]

Source	SS	df	MS	F
Between	143.47	89	1.61	
Supervisory Style (SS)	41.61	1	41.61	49.50****
Social Need (SN)	9.27	2	4.63	5.51**
SS X SN	4.23	2	2.11	2.52
Session (S)	10.56	2	5.28	6.28**
SS X S	10.76	2	5.38	6.40**
SN X S	2.91	4	0.73	0.87
SS X SN X S	2.26	4	0.56	0.67
Intra Session Interval (I)	10.28	4	2.57	3.06*
SS X I	8.16	4	2.04	2.43*
SN X I	7.14	8	0.89	1.06
SS X SN X I	2.55	8	0.32	0.38
S X I	1.19	8	0.15	0.18
SS X S X I	9.79	8	1.22	1.46
SN X S X I	11.79	16	0.74	0.88
SS X SN X S X I	10.96	16	0.69	0.81
Within	151.33	180	0.84	
Total	294.80	269		

*p <.05
**p <.01
****p <.0001

[a]This represents the summed total of all verbal interactions in the tenth, eleventh, and twelfth categories of the Bales (1950) Interaction Process Analysis system.

With respect to the total number of interactions summed across the 12 IPA categories, highly significant main effects were found for Supervisory Style, Social Need Level, Session, and Intrasession Interval. In addition, the Supervisory Style X Social Need Level interaction, the Supervisory Style X Session Interaction, and the Supervisory Style X Intrasession Interval interaction were statistically significant (see Table 2). Figures 4 and 5 illustrate the differences in mean number of group interactions for each Social Need Level under democratic supervision (see Figure 4) and under autocratic supervision (see Figure 5).[1] The total number of verbal interactions was greater for the democratic groups than for the autocratic groups. For groups composed of individuals with high levels of social need the mean number of total verbal interactions was greatest, while those low in social need had the fewest number of verbal interactions. The mean number of total verbal interactions of groups moderate in social need fell between these two extremes. For all groups it appeared that mean verbal interactions decreased with each subsequent session, with the largest decrease occurring from the first to the second session. With respect to Intrasession Interval, it appeared that the greatest mean number of verbal interactions occurred during the first interval, with a decrease during the second, and a slight increase from the third interval to the conclusion of the session. However, the significant Supervisory Style X Session and Supervisory Style X Intrasession Interval interactions suggested that there may have been deviations in this general trend between the two Supervisory Style conditions. Omega-square statistics were .3415 for Supervisory Style, .0944 for Social Need Level, .0447 for Session, .0603 for Intrasession Interval, and .0503 for the Supervisory Style X Social Need Level

[1]The set of two figures graphs the Supervisory Style X Social Need Level X Session X Intrasession Interval interaction.

FIGURE 4. MEAN NUMBER OF GROUP INTERACTIONS BY SESSION AND INTRASESSION INTERVAL FOR EACH SOCIAL NEED LEVEL (SN) UNDER DEMOCRATIC SUPERVISION

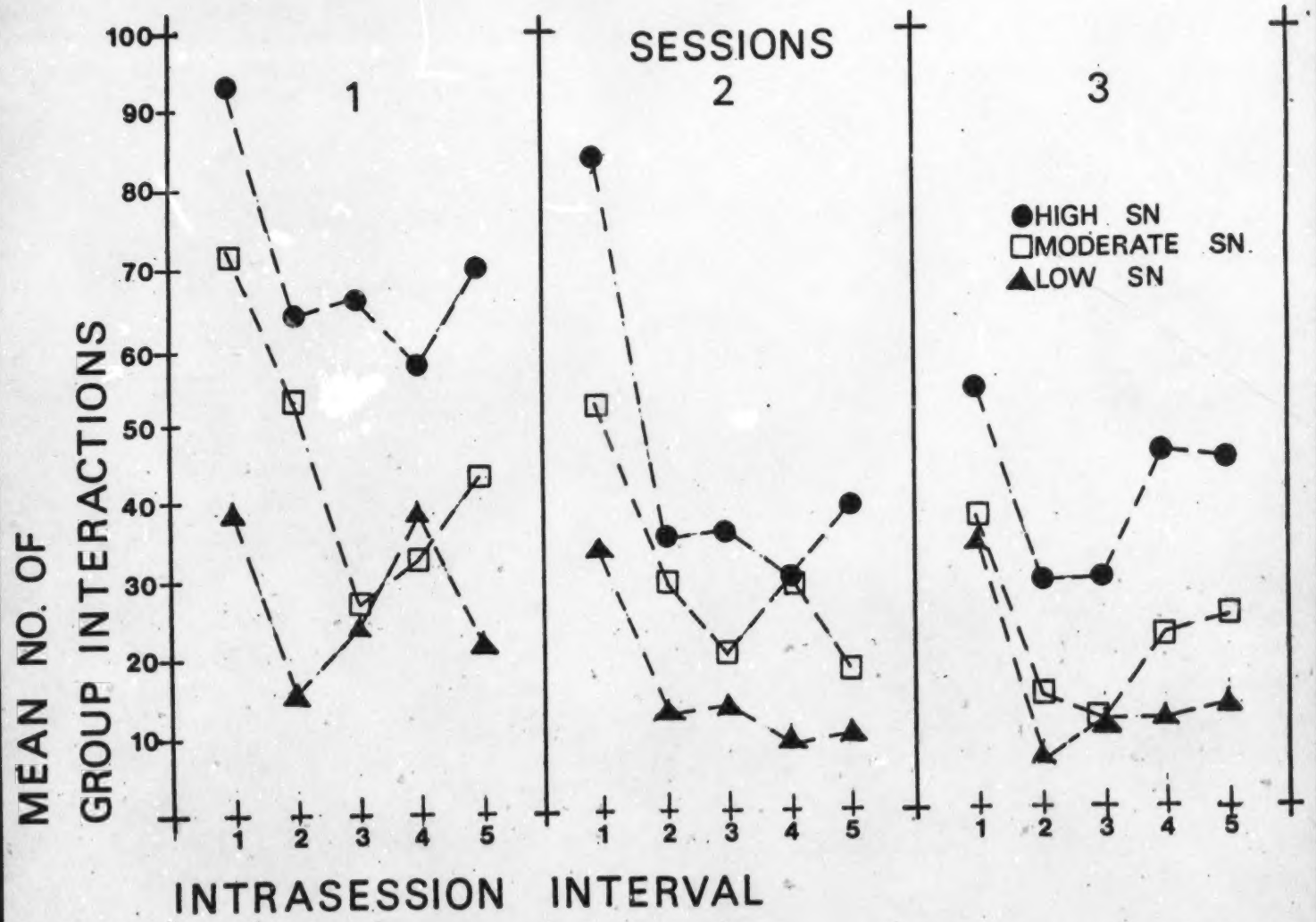
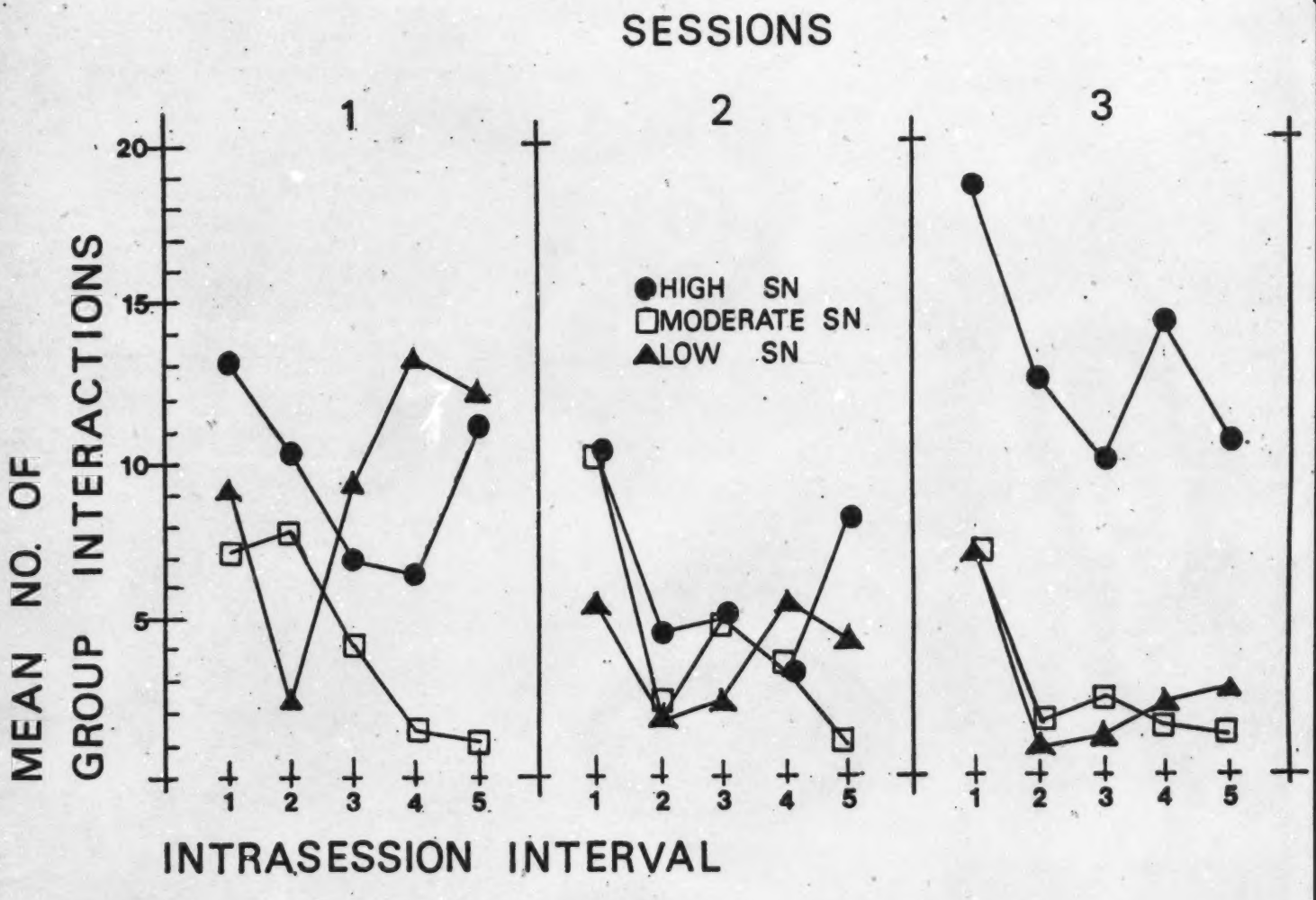


FIGURE 5. MEAN NUMBER OF GROUP INTERACTIONS BY SESSION AND INTRASESSION INTERVAL FOR EACH SOCIAL NEED LEVEL (SN) UNDER AUTOCRATIC SUPERVISION



interaction. Thus, it generally appeared that each of these effects were of practical significance in accounting for a substantial proportion of the variance in total verbal interactions.

With respect to individual categories of verbal interaction, significant main effects for Supervisory Style ($p < .05$) were found in each IPA category except "Gives suggestions" and "Seems unfriendly". Significant main effects for Social Need Level were found in each IPA category except "Asks for suggestions", "Disagrees", and "Seems unfriendly" ($p < .05$). Similarly, significant main effects ($p < .05$) for Supervisory Style and Social Need Level were found in every major IPA grouping ("positive socioemotional reactions", "task answers", "task questions", and "negative socioemotional reactions"). Significant Supervisory Style X Social Need Level interactions were found in every IPA category and major grouping except "Gives suggestions", "Asks for suggestions", "Shows tension", and "negative socioemotional reactions" ($p < .05$). Significant main effects ($p < .05$) for Session were found in each major IPA grouping and in five individual categories. Significant main effects ($p < .05$) for Intrasession Interval were found in each major IPA grouping and in eight individual IPA categories.

For individual IPA categories and their major groupings in which the main effects for Supervisory Style were significant, democratic groups yielded greater numbers of interactions than autocratic groups. For IPA categories and major groupings in which the main effects for Social Need Level were significant, higher social need levels appeared to be associated with greater numbers of group interactions. In those categories and major groupings that yielded significant main effects for Session, verbal interactions tended to decrease with each subsequent session. Similarly, interactions in many IPA categories and major groupings decreased from the first to the second Intrasession Interval.

When significant Supervisory Style X Social Need Level interaction effects were found, the number of interactions tended to increase as Social Need Level increased for the democratic groups. However, this trend was less apparent for the autocratic groups. In summary, the results of the analyses for the individual IPA categories and their major groupings were similar to those for the total number of group interactions.

Group productivity was correlated[1] (typically negatively) with each IPA category for each Supervisory Style (see Table 7) and for each Supervisory Style X Social Need Level combination (see Table 8). With respect to Supervisory Style, the productivity of democratic groups was negatively correlated ($p < .05$) with each IPA category except "Shows tension" and "Seems unfriendly". However for autocratic groups, only the negative correlation between "Gives suggestions" and group productivity was significant (see Table 7). With respect to each Supervisory Style X Social Need Level combination, group productivity was negatively correlated ($p < .05$) with "Gives suggestions" in each condition. In summary, democratic groups produced more significant negative correlations between verbal interactions and group productivity than did autocratic groups. "Asks for opinions" yielded a significant positive correlation with productivity for autocratic supervision-moderate social need groups (see Table 8).

The frequency of procedural violations in the autocratic condition (the occurrence of verbal interactions among autocratic group members) was recorded for groups according to their Social Need Level. Within the autocratic condition there were two such violations among groups low in social need, four among groups moderate in social need, and 18 violations among groups high in social need. Thus, it appeared that groups composed of individuals with high levels

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[1]Pearson Product-Moment Correlations.

TABLE 7

CORRELATIONS OF GROUP PRODUCTIVITY WITH INTERACTION CATEGORY FOR EACH SUPERVISORY STYLE

Interaction Category	r	
	democratic	autocratic
1. Seems friendly	-0.20*	0.00
2. Dramatizes	-0.23**	-0.08
3. Agrees	-0.46****	-0.15
4. Gives suggestions	-0.46****	-0.39****
5. Gives opinions	-0.37****	-0.02
6. Gives information	-0.41****	-0.07
7. Asks for information	-0.37****	+0.01
8. Asks for opinions	-0.26**	+0.02
9. Asks for suggestions	-0.26**	+0.05
10. Disagrees	-0.19*	+0.12
11. Shows tension	+0.10	+0.02
12. Seems unfriendly	-0.04	0.00

*p < .05
**p < .01
****p < .0001

Note. N = 135

TABLE 8

CORRELATIONS OF GROUP PRODUCTIVITY WITH INTERACTION CATEGORY FOR EACH CELL

Interaction Category	r					
	Demo-L	Auto-L	Demo-M	Auto-M	Demo-H	Auto-H
1. Seems friendly	+0.02	+0.02	-0.28	-0.29*	-0.21	+0.19
2. Dramatizes	-0.03	-0.13	-0.35*	-0.21	-0.23	-0.01
3. Agrees	-0.33*	-0.25	-0.60****	-0.24	-0.25	+0.06
4. Gives suggestions	-0.46**	-0.56****	-0.51***	-0.45**	-0.41**	-0.30*
5. Gives opinions	-0.38**	-0.18	-0.51***	-0.13	-0.32*	+0.11
6. Gives information	-0.43**	-0.22	-0.57****	-0.16	-0.39**	+0.06
7. Asks for information	-0.41**	-0.17	-0.39**	-0.07	-0.49***	+0.11
8. Asks for opinions	-0.39**	-0.25	-0.37*	+0.31*	-0.16	+0.12
9. Asks for suggestions	-0.33*	0.00	-0.36*	0.00	-0.06	+0.11
10. Disagrees	+0.03	+0.17	-0.16	0.00	-0.27	+0.04
11. Shows tension	+0.12	0.00	0.12	-0.02	-0.05	+0.06
12. Seems unfriendly	0.00	0.00	-0.02	0.00	0.00	0.00

*p <.05
**p <.01
***p <.001
****p <.0001

Note. N = 45

of social need had a greater tendency to violate the procedural instructions in the autocratic condition than were groups composed of individuals with lower levels of social need.

Analysis of Semantic Differential Scale Responses

A two-way analysis of variance (ANOVA) design with Supervisory Style (two levels: democratic, autocratic) and Social Need Level (three levels: low, moderate, high) as the between subjects factors was performed for each of the ten pairs of bipolar adjectives. Group member descriptions of their supervisors along a seven-point scale served as the dependent variable for these analyses. Significant main effects for Supervisory Style were found on the following dimensions: autocratic-democratic, dull-sharp, unfair-fair, and strict-permissive ($p < .05$). Significant main effects for Social Need Level were also found on the cool-warm, unfair-fair, and strict-permissive dimensions ($p < .05$). Further, significant Supervisory Style X Social Need Level interactions were found on the dull-sharp, dissatisfying-satisfying, and cool-warm dimensions.

In summary, democratic group members described their supervisors as more democratic, sharp, fair, and permissive than did autocratic group members. Groups high in social need described their supervisors as more warm, fair, and permissive than did groups with lower levels of social need. With respect to the dull-sharp dimension, democratic groups high or moderate in social need described their supervisors as more sharp than did the autocratic groups with similar social need levels. Autocratic groups low in social need, however, described their supervisors as more sharp than did the democratic groups that were also low in social need. Similar trends in the Supervisory Style X Social Need Level interaction were found on the dissatisfying-satisfying and cool-warm dimensions.

DISCUSSION

Although it was hypothesized that the relationship between supervisory style and group productivity would be moderated by the variable of social need, the results of the present experiment indicated that autocratically supervised groups were more productive than democratic groups at each Social Need Level. There are several plausible explanations for this consistent superiority in productivity of autocratic supervision across all levels of social need. First, the superiority in productivity of autocratic groups may possibly be related to the lack of an absolute autocracy in this experimental condition. For instance, autocratic supervisors engaged in a number of verbal interactions categorized in the "Task questions" major grouping. One might not expect a true autocratic supervisor to ask for information, opinions, or suggestions. However, it appeared that autocratic supervisors high in social need had a greater tendency to engage in "Task questions" than those moderate or low in social need. Additionally, there were greater numbers of procedural violations in the autocratic condition among high social need groups. More nonverbal communication under autocratic supervision was observed among high social need groups, although nonverbal interactions were not systematically measured in the present investigation. Perhaps these indices reflect the tendency for groups high in social need to circumvent the experimental restrictions imposed in the autocratic condition. The possible lack of an absolute autocracy in the present study was further evidenced in the analysis of group member responses to the semantic differential scale. Along the autocratic-democratic dimension, autocratically supervised group members viewed their supervisors as slightly more democratic than autocratic in the absolute sense, although they were described as significantly less democratic than were the democratic supervisors. It is doubtful whether this reflected a social

desirability response set or whether it reflected actual behavioral differences among supervisors.

Second, the present findings appear to be congruent with Fiedler's (1967) contingency model of leadership effectiveness, to the extent that democratic and autocratic supervision as defined in the present study are related to Fiedler's concept of high and low LPC leaders. The high LPC leader was described as one who sought esteem through interpersonal relations while the low LPC leader sought esteem by means of successful task completion. Thus, autocratic and democratic supervision would seem to be somewhat analogous to low and high LPC leaders respectively. Fiedler's model predicts that when the task is structured, when leader-member relations are good, and when the leader's position power is favorable, low LPC leaders are more effective than high LPC leaders in terms of group performance. The puzzle task in the present study was a structured one in terms of Shaw's (1963) dimensions of decision verifiability, goal clarity, goal path multiplicity, and solution specificity. To the extent that groups homogenous with respect to the expressed and wanted aspects of inclusion and affection (Social Need Level) are viewed as compatible (Schutz, 1958), one might expect that the leader-member relations of groups in the present study to have been good. Further, the position power of supervisors might also have been seen as strong, since supervisors were appointed by the experimenter. Thus, the present study appeared to have created experimental conditions more favorable for a low LPC leader. In fact, Fiedler's LPC concept also appears related to the construct of social need. Kuehl, DiMarco, and Wims (1975) found that FIRO-B scale scores, with the exception of expressed control, were positively correlated with LPC scores. One might then compare a high LPC leader with one that is also high in terms of social need and a low LPC leader with one whose social need is low. Since low social need groups were found to

be significantly more productive than those either high or moderate in social need, these findings would likewise appear to be consistent with Fiedler's model.

A third and final explanation for the greater effectiveness of autocratic supervision may be found in the analyses of group verbal interactions. It was found that autocratically supervised groups had significantly fewer numbers of verbal interactions than did the democratic groups. This should not appear surprising, as only the supervisor was permitted to talk in the autocratic condition. More importantly, group productivity was generally negatively correlated with the number of verbal interactions in most IPA categories. One possible interpretation of these results is that the democratically supervised groups were less productive because they engaged in more time consuming communication. An alternative explanation is that the democratic groups engaged in more conversation because they were less productive from the beginning. However, the first of these two interpretations would seem more plausible since it was found that group productivity tended to increase dramatically from the first to the second Intrasession Interval together with a sharp decrease in verbal interactions at the same time. Slight increases in verbal interactions through the remainder of the session appeared to be simultaneously associated with slight decreases in productivity for most groups. In summary, autocratic supervision may have been more productive at each Social Need Level due to a fewer number of verbal interactions. Similarly, the low social need groups may have been more productive because of a lesser tendency to engage in large amounts of task irrelevant communication than the high social need groups.

With respect to group productivity, Social Need Level did not appear to moderate differences between the two supervisory styles as hypothesized. However, significant Supervisory Style X Social Need Level interactions were

found with respect to the semantic differential responses. Low social need-autocratic supervisors were described as more sharp, satisfying, and warm than were low social need-democratic supervisors. However with respect to moderate and high social need groups, autocratic supervisors were described as less sharp, satisfying, and warm than their democratic counterparts. Thus, Social Need Level did appear to moderate responses to the semantic differential scale along several dimensions. Social Need Level was also found to have been a significant moderator in at least one other study. DiMarco, Kuehl, and Wims (1975) found that leadership style (LPC scale; Fiedler, 1967) and interpersonal need orientation (FIRO-B) moderated changes in pre- and post-training leadership dimension scores (LOQ, Fleishman, 1969).

The findings of the present investigation are consistent with those in one of two prior laboratory experiments. Shaw (1955) found autocratic supervision to have been more effective than democratic supervision in terms of productivity on the largely structured task of arithmetic problem solving. This finding is generally supportive of Fiedler's notion that a structured task situation is more favorable for the low LPC leader. In contrast, Day and Hamblin (1964) demonstrated that democratic supervision led to greater productivity on an assembly-line task. One possible reason for this discrepancy in results is that Shaw (1955) utilized male undergraduates as subjects and supervisors, while Day and Hamblin (1964) employed females in these experimental roles.

Several methodological limitations in the present study became evident during the course of the experiment. First, the IPA system could not consistently differentiate "task-relevant" from "task-irrelevant" interactions, although the positive and negative socioemotional reactions were probably the most similar groupings to the concept of "task-irrelevant" verbal interaction. Perhaps Lewin's (Lewin, et al., 1939) measure of "work-minded conversation"

would be an important addition in future research. Second, the IPA system does not code nonverbal interactions as reliably as it does verbal interactions (McGrath & Altman, 1966; Steiner, 1972). For this reason, the categorization of nonverbal communication was not attempted in the present investigation. Unfortunately, a large amount of nonverbal communication was observed, particularly in the high social need-autocratic condition, which was not subjected to systematic analysis. Third, puzzle-solving ability was one potentially important variable which was not controlled among the groups prior to the experiment. However, neither the Groups factor nor the Subjects within Groups factor were statistically significant in the analysis of variance of group productivity (see Table 1). Unless puzzle-solving ability is significantly correlated with social need, the use of several groups per condition and the random assignment of groups to conditions would appear to have been adequate controls.

The present findings have a number of implications for future research. First, it would seem desirable that the present study be replicated with appropriate methodological revisions as previously discussed. In addition, it is recommended that each session be lengthened somewhat to reduce the possibility of a "floor effect" in productivity among groups. Second, other possible moderators of supervisory style effectiveness such as Achievement via Conformance versus Achievement via Independence (Gough, 1957; Domino, 1971), locus of control, field orientation, or expressed versus wanted control (Schutz, 1967) may potentially be useful areas of exploration in the future. Third, it would appear that future investigations should attempt to focus upon the behavioral aspects of supervision and leadership, such that they may have a significant impact upon employee placement, supervisory training, and theories of work motivation.

In summary, the major findings of the present investigation would lead one to make the following general conclusions:

1. Autocratically supervised groups were more productive than democratically supervised groups, at least in a relatively short-term structured task.
2. Groups composed of individuals low in social need were more productive than groups either moderate or high in social need.
3. The quantity of verbal interactions appeared to be directly associated with social need level.
4. In general, group productivity was negatively correlated with the quantity and quality of verbal interactions, suggesting that autocratic and low social need groups were more productive because they engaged in less conversation.

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